3126A

REQUENCY SELECTIVE VOLTMETER

RYCOM

INSTRUMENTS

RYCOM INSTRUMENTS
Railway Communications Inc
9351 East 59th Street
Raytown, Missouri 64133

3126A
FREQUENCY SELECTIVE VOLTMETER

Serial No. _____

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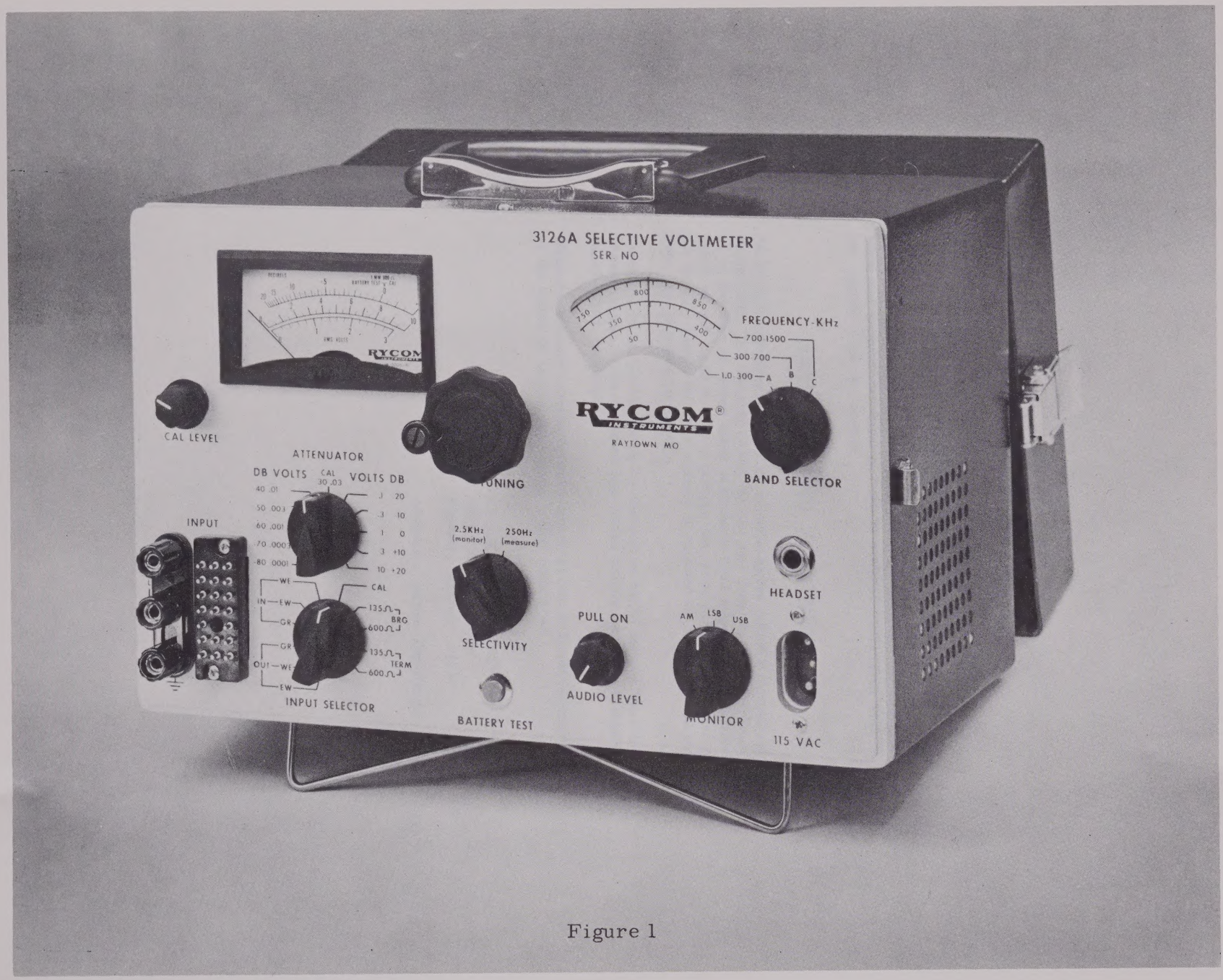

3126A SELECTIVE VOLTMETER
SER. NO
RYCOM
INSTRUMENTS
RAYTOWN, MO
FREQUENCY-KHz
700-1500
300-700
1.0-300
A
B
C
CAL LEVEL
TUNING
BAND SELECTOR
ATTENUATOR
DB VOLTS
CAL
VOLTS DB
INPUT
INPUT SELECTOR
2.5KHz (monitor)
250Hz (measure)
SELECTIVITY
BATTERY TEST
PULL ON
AUDIO LEVEL
AM
LSB
USB
MONITOR
HEADSET
115 VAC

Figure 1

CERTIFICATION

The RYCOM Instruments Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory.

WARRANTY AND ASSISTANCE

All RYCOM Instruments Products are warranted against defects in material and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed below for the specified period we will repair or replace products that prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

Exceptions in our products using dry batteries or Ni-Cad batteries the above warranty applies to the equipment only. Ni-Cad batteries are subject to original manufacturers inspection.

Where it is necessary to return the instrument to the factory, furnish information to the nature of trouble encountered. Ship prepaid to:

RYCOM INSTRUMENTS
9351 East 59th Street
Raytown, Missouri 64133

Attention: Service Department

CHAPTER I

GENERAL

1. SCOPE.

This manual describes the RYCOM Model 3121 and 3126 Frequency Selective Voltmeters. It is battery operated requiring 115 VAC power for battery charging.

The 3121 Frequency Selective Voltmeter is intended for general use where it is desired to measure the level of individual or a narrow band of frequencies.

The 3126 Frequency Selective Voltmeter operates the same as the 3121 Voltmeter. It has a special input circuit to allow connection to a 20 pin connector on Western Electric O, N and ON carrier systems.

Table 1 lists the specifications and Table 2 lists the operating controls and indicators for the voltmeter. Figure 1 shows a photograph of the Voltmeter.

2. DESCRIPTION.

The Voltmeter is a fully transistorized battery operated instrument that measures voltage from 7.75 microvolts to 9.75 volts (-100 DBM to +22 DBM) in a frequency range of 1 KHZ to 1.5 megahertz. The Voltmeter has a 250 hertz bandwidth filter that makes it particularly useful for analyzing complex wave forms, determining carrier system levels and checking amplitude modulation percentages. It also has a 2.5 KHZ bandwidth filter for measuring single sideband carrier noise and for suppression of unwanted signals. Special features include an internal oscillator for calibration purposes, a loudspeaker or headphone jack for aural monitoring and a built-in battery charger.

A compact metal cabinet 8 inches high, 12 inches wide and 9 inches deep is used to house the instrument. The weight of the instrument with battery is 14 pounds. The front panel contains all of the operating controls and is protected from damage by a removable metal cover. The PULL ON control switch will be placed in the OFF position when the cover is installed, thereby preventing the possibility of battery discharge while the instrument is not in use.

The major portion of Voltmeter circuitry is laid out on printed circuit boards and assembled into six separate modules. Extensive shielding is provided for modules and components to prevent interaction between circuits.

The Voltmeter is powered by a rechargeable nickel-cadmium battery for up to 35 hours of operation without charging. A polar three-pin male connector mounted to front panel provides access for battery charging from 115 VAC. The Voltmeter may be operated while charging.

Table 1 3126 SPECIFICATIONS

FREQUENCY RANGE	1 KHZ to 1500 KHZ (3 bands) Band A 1 KHZ to 310 KHZ Band B 300 KHZ to 700 KHZ Band C 700 KHZ to 1500 KHZ
INPUT IMPEDANCES	Model 3126 135Ω (balanced or unbalanced) 600Ω (balanced or unbalanced) Bridging (balanced or unbalanced) Nominal 4K
INPUT LEVEL	Model 3126 7.75uv to 10 V, 600Ω only -100 dbm to +22 dbm
SELECTIVITY	250 HZ ± 25 HZ at 3 db down 1100 HZ Maximum at 60 db down 2500 HZ Nominal at 3 db down 10,000 HZ Maximum at 60 db down
FREQUENCY ACCURACY	Band A ± 1 KHZ Band B ± 2 KHZ Band C ± 3 KHZ
MEASUREMENT ACCURACY	± 1 db
SPURIOUS RESPONSE AND INTERMODULATION PRODUCTS	Greater than 55 db down
INTERNAL CALIBRATION SOURCE	250 KHZ Crystal Oscillator
TYPES OF DEMODULATION	AM, LSB and USB
TEMPERATURE RANGE	-10 to + 50° C
POWER SUPPLY	12 volt nickel-cadmium battery rechargeable from 115 VAC
CURRENT DRAIN	35 MA average
BATTERY LIFE	35 hours without recharging
OVERALL DIMENSIONS	8" h x 12" w x 9" d
WEIGHT	14 pounds

Table 2 OPERATING CONTROLS

Panel Marking	Description	Function
BAND SELECTOR	3 position rotary switch	(1) sets frequency of band to be tuned. (A) 1 KHZ to 300 KHZ (B) 300 KHZ to 700 KHZ (C) 700 KHZ to 1500 KHZ
TUNING	Driven tuning mechanism, 2 speed	Tunes Voltmeter to frequency indicated on dial face
SELECTIVITY	2 position rotary switch	Sets bandwidth 250 HZ or 2. 5 KHZ
ATTENUATOR	11 position rotary switch	Serves as level range control by controlling Voltmeter sensitivity in 10 DB steps up to 100 DB
INPUT SELECTOR	Model 3121: 5 position rotary switch Model 3126: 11 position rotary switch	(1) 600Ω, 135Ω, 75Ω (3121) or TERM (3126) positions connect Voltmeter input circuits to input jacks for terminated inputs. (2) BRIDGE (3121) or BRG (3126) position connects Voltmeter input circuits to input jacks for bridging measurement. (3) CAL switches input circuit for calibration. (4) Model 3126: IN and OUT positions connect Voltmeter input circuit to 20 pin connector A1J1.
CAL LEVEL	Potentiometer	Adjust overall Voltmeter gain when calibrating
MONITOR	3 position rotary switch	Switch for AM and single sideband (LSB, USB) demodulation
AUDIO LEVEL & PULL ON	Potentiometer & switch	(1) Adjust AUDIO LEVEL for speaker or headset level. (2) PULL ON provides connection of battery power to unit.
HEADSET	Headphone jack	Provision for audio monitoring
115 VAC	Cord and connector, polarized	115 volt cord and connector for charging circuit & AC operation
INPUT	Model 3121 & 3126: Binding posts Model 3126: 20 pin connector	Input connectors for (75Ω 3121 only) 135Ω or 600Ω line measurements. Shorting link (3126) is used on unbalanced lines.

CHAPTER II

3126 OPERATION

1. PREPARATION.

The Voltmeter has been thoroughly inspected at the factory and is covered by Warranty. Prior to use, the instrument should be inspected, for in-transit damage.

If damage has occurred it should be reported to the carrier and to RYCOM INSTRUMENTS INC.

The Voltmeter is shipped ready for use with battery installed.

2. BATTERY.

The battery will provide up to 35 hours of operation between charges. A completely discharged battery will recharge in eighteen hours or less. Continuous charging is permissible without damage to the battery. It is recommended that a routine recharging schedule be established depending upon unit use. The battery should be charged at least once per month.

The following check tests the condition of the battery while battery is delivering full load current.

a. Pull AUDIO LEVEL control to switch power on. Press BATTERY TEST switch.

b. Observe meter. Battery is fully charged when the meter indicates O DB ±. 5 DB. If the indication is below -. 5 DB recharge battery.

3. OPERATIONAL CALIBRATION.

This procedure checks the main tuning dial and the Voltmeter level sensitivity.

To calibrate the Voltmeter proceed as follows:

a. Set INPUT SELECTOR switch to CAL position.

b. Set ATTENUATOR switch to -30 DB CAL position.

c. Set SELECTIVITY TO 250 HZ.

d. Set BAND SELECTOR to band A.

e. Rotate TUNING dial control to 250 KHZ.

f. Adjust TUNING control for maximum indication on the meter.

g. Adjust CAL LEVEL control for 0 DBM indication on meter. The Voltmeter is now calibrated for voltage and DBM (600Ω) and DBM (135Ω). See Correlation Chart, paragraph 4.

h. A frequency check may be made by tuning dial throughout its range. An indication will be noted at every 250 KHZ point (i. e., 500, 750, 1000, 1250, and 1500 KHZ).

4. CORRELATION CHART: TERMINATION, CALIBRATION, IMPEDANCE METER INDICATION.

VOLTMETER	INPUT SELECTOR	CALIBRATION IMPEDANCE	METER INDICATION
3126	135Ω TERM	600Ω	DBM from 135Ω source.
	135Ω BRG	600Ω	DBM from 135Ω source.
	600Ω BRG	600Ω	Volts from any low impedance source and DBM from 600Ω source.
	600Ω TERM	600Ω	Volts or DBM from 600Ω source.

5. LINE MEASUREMENTS - INPUT JACKS.

To perform line measurements, proceed as follows:

a. Connect Voltmeter INPUT to circuit to be tested. For unbalanced lines, use shorting link. For balanced lines disconnect shorting link.

b. Calibrate Voltmeter per paragraph 3.

c. Set INPUT SELECTOR switch to desired impedance setting.

d. Rotate TUNING control and switch BAND SELECTOR to frequency of signal being measured.

e. Rotate ATTENUATOR selector switch until meter indication is in upper 2/3 of scale.

f. Adjust TUNING control for maximum indication on meter.

g. Read meter indication. See Correlation Chart, paragraph 4. To obtain the input signal level, algebraically add the meter indication to the ATTENUATOR setting.

6. LINE MEASUREMENTS - BALANCED

The 20-pin input connector is provided for bridging onto 135Ω balanced carrier lines. To perform 135Ω carrier line measurements, proceed as follows:

a. Patch Voltmeter to circuit to be tested.

b. Calibrate Voltmeter per paragraph 3.

c. Set INPUT SELECTOR switch as required for circuit to be measured.

d. Rotate BAND SELECTOR and TUNING control to frequency of signal to be measured.

e. Rotate ATTENUATOR selector switch until meter reading is in upper 2/3 scale.

f. Adjust TUNING control for maximum indication on meter.

g. Read meter indication in DBM. To obtain the input signal level, algebraically add meter indication to ATTENUATOR setting.

7. MONITORING

Provision is made to monitor audio signals that may be present on line signals under measurement. To monitor signals, switch SELECTIVITY to 2.5 KHZ, set MONITOR switch in desired position (AM, LSB or USB) and adjust AUDIO LEVEL control.

CHAPTER III

THEORY OF OPERATION

1. GENERAL.

The Voltmeter employs a single conversion superheterodyne circuit to measure frequencies in the range of 1 KHZ to 1. 5 MHZ with a bandpass of 250 HZ or 2. 5 KHZ. Figure 12 illustrates a functional block diagram of the Voltmeter. Figure 13 shows a schematic diagram of the Voltmeter.

At the input of the Voltmeter, a switch is used to select the input signal from either the 250 KHZ calibrate oscillator or from the front panel input connectors. A filter and matching network is incorporated in the input circuits to attenuate unwanted high frequency components and to provide proper input impedances.

To control the sensitivity of the Voltmeter, a variable attenuator provides up to 100 DB of attenuation in 10 DB steps. Tuning of the Voltmeter is accomplished by a variable oscillator (local oscillator) that operates over the frequency range of 2216 KHZ to 3715 KHZ. Both the input signal and the local oscillator signal are applied to a mixer stage where the heterodyning action takes place to produce a 2215 KHZ difference frequency. The IF amplifier is tuned to 2215 KHZ and amplifies the output of the mixer.

The 250 HZ and 2. 5 KHZ bandpass of the Voltmeter is determined by crystal filters located between the 1st and 2nd IF amplifiers. After amplification by the IF amplifier, the signal is rectified and filtered in a meter detector circuit and then applied to a meter.

The second detector when used with insertion frequency of 2213. 5 KHZ and 2216. 5 KHZ will produce single sideband demodulation for audio monitoring.

The calibrate oscillator generates a 250 KHZ square wave and is regulated for amplitude level to provide an output level that is equivalent to -30 DBM at the input connectors. Before voltage measurements are made, the Voltmeter sensitivity is calibrated by connecting the calibrate oscillator output to the Voltmeter input circuits and adjusting the IF amplifier gain for 0 DBM indication.

When the Voltmeter is used for power measurements, the variable attenuator is used to change the Voltmeter sensitivity in calibrated steps of 10 DB. For example, assume that a signal level of -42 DBM is applied to the input of the calibrated Voltmeter. Adjusting the attenuator to the -40 DB position will result in an indication of -2 DB. The input level is determined by algebraically adding the meter indication to the attenuator setting: -40 DB -2 DB = -42 DBM.

2. INPUT MODULE A1

The input circuits are composed of an INPUT SELECTOR switch S1, (an isolation transformer T1, 3126 only) and a 100 DB ATTENUATOR S2. Input signals are applied to the input binding posts E1 and E2 (or the 20 pin INPUT connector J1 on Model 3126). On the 3126 the INPUT SELECTOR switch S1 selects, terminates and applies the proper input signal to transformer T1.

Resistors R1, R2 or R3 are switched by S1 to provide termination for (75Ω Model 3121 only) 135 ohm or 600 ohm lines. In the Model 3126, Switch S1 also switches the compensating pad R4, R5 and R6 into the circuit for voltage or DBM measurements on 600 ohm lines. The pad is switched out for DBM measurements on 135 ohm lines.

3. EMITTER FOLLOWER AND CALIBRATE OSCILLATOR MODULE A2.

The function of the bootstrapped emitter follower is to match the attenuator S2 to the lowpass filter FL3.

The calibrate oscillator is 250 KHZ crystal controlled, biased so the output voltage swings between the regulated power supply voltage and ground. The output is applied through a CAL OSC ADJ potentiometer R12 to switch S1 for calibrating the Voltmeter level and to check the dial frequency accuracy.

4. LOWPASS FILTER FL3.

The lowpass filter is a two-section pi constant K derived, with M derived end sections. The cutoff frequency is 1.76 MHZ and provides 60 DB of attenuation at 2215 KHZ. The input and output impedances are 150 ohms.

5. OSCILLATOR-MIXER MODULE A3.

The input signal is heterodyned with the local oscillator injection in balanced modulator diodes CR1. The modulator diodes operate as a balanced shunt modulator and short the signal to ground during half the local oscillator cycle. The 2215 KHZ output of the modulator is capacitive coupled to the base of the first IF amplifier A4Q1.

The modulator driver (Q1) output is transformer (T1) coupled to the modulator diodes. The local oscillator level at the junction of the modulator diodes is very small due to the matching of components. The input to the modulator driver is capacitive coupled from the emitter of the local oscillator Q2.

The local oscillator is a Colpitts type with three switched frequency bands. The frequency on each band is varied by tuning C1, an 11-150 uuf air variable capacitor. The oscillator circuit is temperature stabilized by C8.

6. IF AMPLIFIER MODULE A4.

The 2215 KHZ output of the modulator is capacitive coupled to the first IF amplifier. The amplifier and filter driver consists of three stages, Q1, Q2, and Q3 and has 36 DB gain. Q1 and Q2 is a Darlington connected amplifier. The output is transformer coupled to Q3, the filter driver amplifier.

The Voltmeter contains two crystal filters which are selected by switch S4. The center frequency of both filters is 2215 KHZ and the bandwidths are 250 HZ (FL1) and 2.5 KHZ (FL2) at 3 DB down. Trimmer capacitors C7 through C10 tune the filters for maximum flatness. Each filter has an input impedance of 4000 ohms and an output impedance of 1000 ohms.

The filter matching amplifier and second IF amplifier consists of three stages, Q4, Q5, and Q6. The output of the crystal filter is capacitively coupled to the filter matching amplifier consisting of Q4 and Q5. The bias current of Q5 is adjusted by R2 (CAL LEVEL). Changing the bias current controls the gain of the stage. The output of Q5 drives the common emitter amplifier Q6. The second IF amplifier Q6 has a gain of 20 DB to 50 DB depending upon the setting of R2.

The third IF amplifier Q7 provides 30 DB of gain and is transformer coupled to the IF output amplifier Q8. The output is also capacitive coupled to the meter detector circuit.

The meter detector diode CR1 is a peak envelope type detector. The output is applied through R27 to S6 which is connected to the meter.

The IF output amplifier Q8 provides isolation of the reinsertion oscillator signal and also drives the demodulator diodes CR2 and CR3.

7. DEMODULATOR MODULE A5.

The AM demodulator is a shunt type using CR3 as the diode. S5 connects the anode end to ground when in AM position. R24 and C10 provide RF filtering. The audio signal is capacitive coupled from R1 (AUDIO LEVEL) to the base of Q5, the first audio amplifier.

The sideband demodulator consists of CR2 and CR3 which are supplied with an injection signal from Q4. These diodes operate as a balanced shunt demodulator and shorts the IF signal to ground during half the injection signal cycle. This produces an audio difference signal which is coupled to the base of the first audio amplifier Q5.

The carrier reinsertion oscillator Q3 is crystal controlled by Y1 or Y2. The output is capacitive coupled to balanced phase splitter Q4, which supplies out-of-phase signals to the demodulator diodes CR2 and CR3. MONITOR switch S5 applies power to Q3 and Q4, and selects the crystal for LSB or USB demodulation.

8. AUDIO AMPLIFIER, MODULES A5 and A6

The 1st and 2nd audio amplifier are on module A5 and the audio output amplifier is on module A6. The output of the demodulator is fed thru the RF decoupling network A5R24 and A5C10 to the AUDIO LEVEL control. The AUDIO LEVEL control arm drives the first audio amplifier A5Q5, this stage is "boot strapped" to provide a high input resistance. The second audio amplifier A5Q6 is a common emitter amplifier. The audio output amplifier is made up of A6Q1 a common emitter amplifier, A6Q2 a emitter follower buffer and A6Q3 and A6Q4 the output pair. Feedback thru A6R2 reduces the gain of the output amplifier to approximately 6DB. The output signal is fed thru A6C3 to the HEADSET receptacle and the speaker.

9. REGULATOR AND CHARGER, MODULE A5.

The regulator is a series type, with Q1 as the series regulator transistor, and Q2 as the control amplifier. VR1, a 9.1 volt reference diode, controls the bias on Q2. The output is also connected through resistor R4 to the battery test switch for checking battery condition. A meter reading of 0 DB ±.5 DB indicates the battery charge is adequate for regulator operation.

The battery BT1 charging circuit consist of CR1, C2 and R3 on the module and power transformer T1 which is mounted on the chassis. The charging circuit is activated anytime the unit is connected to a 115 VAC 60 cycle source through the power cable supplied.

CHAPTER IV

MAINTENANCE

1. INTRODUCTION.

This equipment will give comparatively trouble free performance provided normal operating procedures are observed. In the event of any malfunction, first check the battery by turning the unit ON, press the BATTERY TEST button and observe the meter for a 0 DB ± .5 DB reading.

Before attempting to trouble shoot the Voltmeter, Chapter III "Theory of Operation" should be studied. The trouble shooting procedure consists of three parts: Isolation to a particular module; Module trouble shooting; Transistor voltage checks.

2. TEST EQUIPMENT.

The following test equipment is required to test and align the Voltmeter and is not supplied.

a. Sweep Generator and Display Unit. Use to align IF amplifier and crystal filters.

1. Center frequency between 50 KHZ and 500 KHZ.

2. Sweep width variable from 5 KHZ to 40 KHZ.

3. Sweep rate 1 to 4 per second.

b. VTVM. (Triplett 850 or equivalent).

c. Counter.

1. Minimum counting rate 3000 KHZ.

2. Gate time 1 second and .01 second.

3. Display time variable.

d. Signal Generator. (Hewlett Packard 651 or equivalent).

e. AC-VTVM. (Ballantine 303 or equivalent).

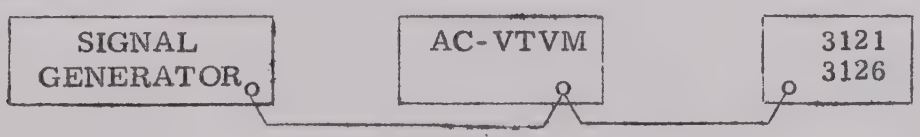


Figure 2
TEST SET UP FOR MODULE ISOLATION

3. TROUBLESHOOTING.

Before proceeding with step 1 in Table 3, connect Voltmeter in the test setup shown in Figure 2 and perform the following steps.

a. Set the Selective Voltmeter as follows:

1. INPUT SELECTOR to BRIDGE (3121) or BRG 600Ω (3126).
2. BAND SELECTOR to band A.
3. TUNING to 250 KHZ.
4. ATTENUATOR to -60 DB.
5. CAL LEV fully clockwise.
6. SELECTIVITY to 2.5 KHZ.

b. Adjust signal generator to 0.78V, 250 KHZ signal output.

Table 3 MODULE ISOLATION

Step	Procedure	Normal Indication	If Indication Is Abnormal
1	Turn unit on. Press BATTERY TEST switch.	Meter reads 0 DB ±.5 DB.	Battery needs recharge or power supply regulator is defective on Module A5. See Table 4.
2	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to pin 7 on Module A2.	AC-VTVM indicates 77 millivolts.	Trouble is in input Module A1. See Table 5.
3	Set INPUT SELECTOR to CAL. Connect AC-VTVM to pin 7 on Module A2.	AC-VTVM indicates 2.5 millivolts.	Trouble is in calibrate oscillator on Module A2. See Table 7.
4	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to pin 1 on Module A2.	AC-VTVM indicates 34 millivolts.	Trouble is in Emitter follower on Module A2. See Table 6.
5	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to pin E2 on Module A4.	AC-VTVM indicates 30 millivolts.	Trouble is in FL3 lowpass filter. See Table 8.
6	Set BAND SELECTOR to band A. Tune dial to zero frequency.	Selective Voltmeter meter reads past full scale.	Trouble is in Module A3. See Table 9.
7	Set INPUT SELECTOR to BRG*. Tune dial to 250 KHZ. Set ATTENUATOR to 0 DBM. Connect AC-VTVM to E6 on Module A4.	AC-VTVM indicates .48 volts.	Trouble is in Module A4. See Table 10.
8	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to E9 Module A5. Set monitor switch to LSB. Audio level to 1/3 CW.	AC-VTVM indicates 0.40 volts.	Trouble is in side-band oscillator Module A5. See Table 11.
9	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to E12 on Module A5. Set MONITOR switch to LSB. AUDIO LEVEL to 1/3 CW.	AC-VTVM indicates approximately 1.6 volts.	Trouble is in audio amplifier Module A5. See Table 12.
10	Set INPUT SELECTOR to BRG*. Set MONITOR switch to LSB. Set AUDIO LEVEL to 1/3 CW.	Aural indication from speaker.	Trouble is in audio amplifier Module A6. See Table 12.

*Model 3121: BRIDGE
Model 3126: BRG 600Ω

Table 4 REGULATOR AND CHARGING CIRCUIT MODULE A5

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Connect VTVM to E4 on Module A5.	VTVM indicates 11.5 to 13.5 volts DC.	Check battery connections. Battery needs recharging.
2	Connect VTVM to E1 on Module A5. Pull AUDIO LEVEL switch on.	VTVM indicates 11.5 to 13.5 volts DC.	Check switch S7 and connections.
3	Connect VTVM to E7 on Module A5. Pull AUDIO LEVEL switch on.	VTVM indicates 9.1 volts DC.	Check Q1 and Q2 voltages. See Table 13.

Table 5 INPUT MODULE A1

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Model 3121: Set INPUT SELECTOR to BRIDGE. Connect AC-VTVM to pin 3 of S1. Set ATTENUATOR to -80 DB.	AC-VTVM indicates .78 volts.	Check C1 and switch S1 connections for continuity.
	Model 3126: Set INPUT SELECTOR to BRG 600Ω. Connect AC-VTVM to pin 6, Sec. C of S1. Set ATTENUATOR To -80 DB.	AC-VTVM Indicates .78 volts.	Check C1, T1, and switch S1 connections for continuity.
2	Set INPUT SELECTOR to BRG*. Connect AC-VTVM to pin 7 on Module A2. Set ATTENUATOR to -80 DB.	AC-VTVM indicates .78 volts.	Check S2 and resistors R7 thru R13.

Table 6 EMITTER FOLLOWER MODULE A2

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 250 KHZ at -30 DB and connect to pin 7 of Module A2. Connect AC-VTVM to Pin 1.	AC-VTVM indicates 11 millivolts.	Check Q1 voltages. See Table 13.

* Model 3121: BRIDGE
Model 3126: BRG 600Ω

Rev 1

Table 7 CALIBRATE OSCILLATOR MODULE A2

Step	Procedure	Normal Indication	If indication is Abnormal
1	Set INPUT SELECTOR to CAL. Connect AC-VTVM to pin 4 on Module A2.	AC-VTVM reads 26 millivolts.	Check Q2 voltages. See Table 13.

Table 8 LOWPASS FILTER FL3

Step	Procedure	Normal Indication	If indication is Abnormal
1	Set signal generator to 250 KHZ at 24.5 MV and connect to IN on FL3. Connect AC-VTVM to pin OUT on FL3.	AC-VTVM reads 22 millivolts.	Check continuity of FL3.
2	Connect ohmmeter from pin IN to OUT.	Ohmmeter reads 2Ω.	Trouble is in FL3.

Table 9 LOCAL OSCILLATOR MODULE A3

Step	Procedure	Normal Indication	If indication is Abnormal
1	Turn unit on. Connect AC-VTVM to junction of R1 and CR1.	AC-VTVM reads .55 volts.	Check Q1, Q2 voltages. See Table 13.
2	Connect AC-VTVM to junction of R5 and R6.	AC-VTVM reads between .15 and .3 volts.	Check Q2 voltages. See Table 13.

Table 10 IF AMPLIFIER MODULE A4

Step	Procedure	Normal Indication	If indication is Abnormal
1	Set signal generator to 2215 KHZ at -100 DB (7.75 uV) and connect to E2 on Module A4. CAL LEVEL full CW Set SELECTIVITY to 2.5 KHZ.	Selective Voltmeter reads -6 DBM.	Adjust T1, T2, and T3 for maximum reading on meter. Check Q1 thru Q8 voltages. See Table 13.

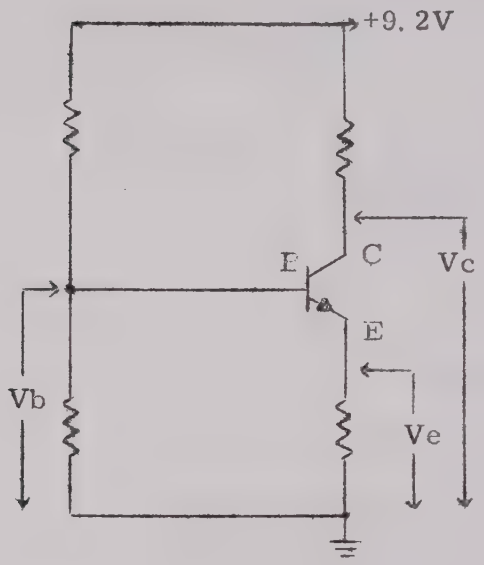
Table 11 REINSERTION OSCILLATOR MODULE A5

Step	Procedure	Normal Indication	If indication is Abnormal
1	Turn MONITOR to LSB. Connect AC-VTVM to base of Q4.	AC-VTVM reads .75 volts.	Check Q3 voltages. See Table 13. Check crystals.
2	Connect AC-VTVM to junction of C8 and R13.	AC-VTVM reads 0.5 volts.	Check Q4 voltages. See Table 13.

Table 12 AUDIO AMPLIFIER MODULE A5 AND A6

Step	Procedure	Normal Indication	If Indication is Abnormal
1	Set signal generator to 1 KHZ at 50 millivolts and connect to E9 on Module A5. Turn R1 AUDIO LEVEL maximum CW. Connect AC-VTVM to base of Q6.	AC-VTVM reads 85 millivolts.	Check Q5 voltages. See Table 13.
2	Connect AC-VTVM to E12 on Module A5.	AC-VTVM reads 3 volts.	Check Q6 voltages. See Table 13.
3.	Connect AC-VTVM to E3 of Module A6.	AC-VTVM reads 3. 5 volts.	Check Q1, Q2, Q3, Q4, and Q5 voltages. See Table 13.

Typical transistor trouble shooting. Figure 3 presents typical trouble shooting for a N-P-N common emitter amplifier stage. Before replacing transistor, check associated circuit components. See table 13 for typical transistor voltages.



a. If Ve is less than indicated and Vb is normal, transistor is open.

b. If Ve is greater than indicated and Vb is normal, transistor is shorted.

c. The normal voltage between base and emitter of an amplifier stage is between . 4 and . 7 volts.

B - Base
C - Collector
D - Emitter

Vb - Base Voltage
Vc - Collector Voltage
Ve - Emitter Voltage

Figure 3
Typical Transistor Trouble Shooting Schematic.

RC 3710

2N3638 and 2N3053

Figure 4
Transistor Lead Configuration.

4. ALIGNMENT.

a. Calibrate Oscillator. In the event of parts replacement or normal aging of parts, it may be necessary to calibrate the Voltmeter. This is accomplished by comparing the calibrate oscillator output level to a known external source. The equipment should be connected as shown in Figure 5 before proceeding with step 1 through 8.

Figure 5
Test Set Up for Level Calibration

1. Adjust Selective Voltmeter controls as follows:

   a. INPUT SELECTOR to BRIDGE (3121) or BRG 600Ω (3126).
   b. SELECTIVITY to 250 HZ.
   c. ATTENUATOR to -30 DB CAL.
   d. BAND SELECTOR to band A.
   e. TUNING to 250 KHZ CAL.

2. Adjust signal generator frequency to 250 KHZ.
3. Adjust signal generator output to -30 DB (24.5 mv) level.
4. Adjust TUNING control for maximum reading on meter.
5. Adjust CAL LEVEL for O DBM reading on meter.
6. Set INPUT SELECTOR to CAL position.
7. Adjust TUNING control for maximum reading on meter.
8. Adjust CAL OSC ADJ R12 on module A2 for O DBM reading on meter. The Voltmeter is now calibrated and ready for operation.

b. IF Amplifier. The alignment of the 2215 KHZ IF amplifier, module A4, is performed by using the internal calibrate oscillator as a signal source. Proceed as follows:

1. Set Selective Voltmeter controls as follows:

   a. INPUT SELECTOR to CAL.
   b. ATTENUATOR to -30 DB CAL.
   c. SELECTIVITY to 250 HZ.
   d. BAND SELECTOR to band A.
   e. TUNING to 250 KHZ CAL for maximum Voltmeter reading.

2. Adjust CAL LEVEL so meter reads in upper half of scale.
3. Adjust T1, T2, and T3 with a non-metallic tuning tool for maximum meter reading.

c. Crystal Filters FL1 and FL2. Crystal filters FL1 and FL2 on module A4 can be adjusted for passband flatness by using the internal calibrate oscillator. Proceed as follows:

1. Set Selective Voltmeter controls as follows:

   a. INPUT SELECTOR to CAL.
   b. ATTENUATOR to -30 DB CAL.
   c. BAND SELECTOR to band A.
   d. TUNING to 250 KHZ CAL.
   e. SELECTIVITY to 2.5 KHZ.

2. Adjust TUNING so that meter reads in valley of passband ripple.
3. Adjust C9 and C10 for maximum meter reading.
4. Repeat steps 2 and 3 until filter FL2 passband ripple is within ±.5 DB.
5. SELECTIVITY to 250 HZ.
6. Adjust TUNING so that meter reads in valley of passband ripple.
7. Adjust C7 and C8 for maximum meter reading.
8. Repeat steps 6 and 7 until filter FL1 passband ripple is within ±.5 DB.

d. Local Oscillator. Alignment of the frequency dial is performed by connecting the equipment as shown in Figure 6.

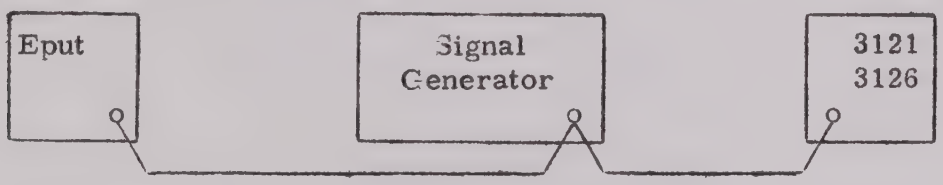


Figure 6
Test Set Up For Frequency Alignment.

1. Set equipment controls as follows:

   a. Signal generator to 0 DB level out.
   b. INPUT SELECTOR to BRIDGE (3121) or BRG 600Ω (3126).
   c. Attenuator to 0 DB.
   d. SELECTIVITY to 250 HZ

2. Band A alignment.

   a. BAND SELECTOR to band A.
   b. SIGNAL generator to 50 KHZ.
   c. TUNING to 50 KHZ.
   d. Adjust L3 for maximum meter reading.
   e. Signal generator to 250 KHZ.
   f. TUNING to 250 KHZ.
   g. Adjust C14 for maximum meter reading.
   h. Repeat steps 2b through 2g until dial tracks within ±1 KHZ on band A.

3. Band B alignment.

   a. BAND SELECTOR to band B.
   b. Signal generator to 350 KHZ.
   c. TUNING to 350 KHZ.
   d. Adjust C16 for maximum meter reading.
   e. Signal generator to 650 KHZ.
   f. TUNING to 650 KHZ.
   g. Adjust C12 for maximum meter reading.
   h. Repeat steps 3b through 3g until dial tracks within 2 KHZ on band B.

4. Band C alignment.

   a. BAND SELECTOR to band C.
   b. Signal Generator to 1400 KHZ.
   c. TUNING to 1400 KHZ.
   d. Adjust C10 for maximum meter reading.

Table 13 Transistor Voltage Chart*

Module	Transistor	Emitter	Base	Collector
A2	Q1	3.7	4.4	9.55
	Q2	2.3	2.1	6.0
A3	Q1	1.85	2.3	6.8
	Q2	1.6	2.0	8.0
A4	Q1	3.3	3.9	9.5
	Q2	2.6	3.3	9.5
	Q3	1.35	2.0	4.6
	Q4	1.9	2.5	3.6
	Q5	1.2	1.9	3.6
	Q6	2.2	2.8	8.9
	Q7	.9	1.5	8.8
	Q8	1.5	2.2	5.0
A5	Q1	9.5	10.3	12
	Q2	0	.65	10.3
	Q3	1.3	1.5	3.5
	Q4	1.7	2.0	7.8
	Q5	1.4	2.2	4.6
	Q6	1.5	2.2	9.2
A6	Q1	1.8	2.4	5.8
	Q2	6.4	7.1	12.0
	Q3	6.4	5.8	0
	Q4	6.2	6.4	12.0
	Q5	0	0	6.4

* Readings taken with VTVM. Readings should be within ±10%.

Set Selective Voltmeter controls as follows:

1. No signal input.
2. CAL LEVEL fully CW.
3. MONITOR - LSB.
4. INPUT SELECTOR - CAL.

5. PARTS LIST.

When ordering parts, always include:

1. Name, Model and Serial Number of the Instrument.
2. Module and circuit symbol.
3. Part number.
4. Description.

Order parts from:

RYCOM INSTRUMENTS
9351 East 59th Street
Raytown, Missouri 64133

Telephone 816-353-2100

Note: $10.00 minimum on all orders.

LIST OF MANUFACTURERS

Symbol is listed in parts list under manufacturer.

Symbol	
A	Allen Bradley Company
B	Belden Mfg. Company
C	C. T. S. Corporation
D	Continental Device Corporation
E	Dale Electronics, Souix Division
F	E. F. Johnson Company
G	Electra Mfg. Company
H	Electro Cube Inc.
I	Electro Motive Mfg. Co. Inc.
J	Electron Products Co.
K	Electronic Research Corp.
L	Erie Technological Products Inc.
M	Fairchild Semiconductor
N	General Electric
O	General Instruments
P	General Radio
Q	Gould National Battery Co.
R	Hammarlund Mfg. Company
S	Mec Incorporated
T	Oaktron Industries Inc.
U	RYCOM INSTRUMENTS INC.
V	Semincon Inc.
W	Spectran Electronics Corp.
X	Switchcraft Inc.
Y	Sylvania Electric Prod. Inc.
Z	Texas Instruments Inc.
AA	Tower Mfg. Corp.
AB	Western Electric Co.
AC	Wilco Corp.
AD	Aladdin Electronics
AE	Callins Industries Inc.
AF	Sprague Electric Co.
AG	Good-All Electric Mfg. Co.
AH	Corning Electronic Components
AI	RCA
AJ	Grayhill
AK	J. W. Miller Co.

*Previously accounted for.

**Components differ in earlier units. Use component listed for replacement part.

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A1			
C1	Cap. 5.0uf ±10% 200 WVDC mylar**	X663F50502W	AG	1
C2	Cap. 0.1uf -20, +80% 25 WVDC disc ceramic	5815Y5U104Z	L	17
C3	Cap. 33uuf ±5% 500 WVDC silver mica	DM15E330J	I	1
	3126 only Ser. No. 682 up			
E1	Binding Post, Red 3121 Ser. No. 126-580	111-102-1	F	1
	Binding Post, Red 3121 Ser. No. 581 up	29-1-R	AJ	1
E2	Binding Post, Black 3121 Ser. No. 126-580	111-103-1	F	1
	Binding Post, Black 3121 Ser. No. 581 up	29-1-B	AJ	1
E1, E2	Binding Post, Red 3126 Ser. No. 511-681	111-102-1	F	2
	Binding Post, Red 3126 Ser. No. 682 up	29-1-R	AJ	2
E3	Binding Post, Metal 3126 Ser. No. 511-681	0938-9701	P	1
	Binding Post, Black 3126 Ser. No. 682 up	29-1-B	AJ	1
None	Shorting Link, 3126 only	0938-9712	P	1
J1	Connector, electrical 20-pin 3126 only	KS-14160-L1	AB	1
R1	Res. 75Ω ±5% Metal Film 3121 only	Type C-42S	AH	1
R2	Res. 140Ω ½W ±1% Metal Film	RY65D1400F	U	1
R3	Res. 681Ω ½W ±1% Metal Film	RY65D6810F	U	1
R4	Res. 1780Ω 1/8W ±1% Metal Film	RY57D1781F	U	2
	3126 only Ser. No. 511-681			
R4	Res. 2610Ω 1/8W ±1% Metal Film	RY57D2611F	U	1
	3126 only Ser. No. 682 up			
R5	Res. 6040Ω 1/8W ±1% Metal Film	RY57D6041F	U	2
	3126 only Ser. No. 511-681			
R5	Res. 4530Ω 1/8W ±1% Metal Film	RY57D4531F	U	2
	3126 only Ser. No. 682 up			
R6	Res. 1780Ω same as R4			
	3126 only Ser. No. 511-681			
R7	Res. 6040Ω same as R5**			
R8	Res. 3400Ω 1/8W ±1% Metal Film	RY57D3401F	U	1
R9	Res. 1620Ω 1/8W ±1% Metal Film**	RY57D1621F	U	1
R10	Res. 4530Ω same as R5			
R11	Res. 499Ω 1/8W ±1% Metal Film	RY57D4990F	U	1
R12	Res. 4990Ω 1/8W ±1% Metal Film	RY57D4991F	U	3
R13	Res. 4870Ω 1/8W ±1% Metal Film	RY57D4871F	U	1
R14	Res. 158Ω 1/8W ±1% Metal Film	RY57D1580F	U	1
R15	Res. 4990Ω same as R12			
R16	Res. 49.9Ω 1/8W ±1% Metal Film	RY57D49R9F	U	1

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A1 (continued)			
R17	Res. 4990Ω same as R12			
R18	Res. 15.8Ω 1/8W ±1% Metal Film	RY57D15R8F	U	2
R19	Res. 15.8Ω same as R18			
S1	Switch, Rotary 3121 only	3121S1A	U	1
S1	Switch, Rotary 3126 only	3126S1	U	1
S2	Switch, Rotary	3121S2	U	1
T1	Transformer, Input 3126 only**	3126A1T1	U	1

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A2			
C1	Cap, 0. 1uf ±10% 200 WVDC metalized mylar**	210B1C104K	H	12
C2	Cap, 0. 01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	14
C3	Cap, 470uuf ±5% 500 WVDC silver mica	DM19E471J	I	1
C4	Cap, 10uf -10+100% 15WVDC dry electrolytic	30D106G015BA2	AF	9
C5	Cap, 0. 1uf same as C1			
C6	Cap, 0. 1uf -20 +80% 25WVDC disc ceramic	5815Y5U104Z	L	*
C7	Cap, 10uf, same as C4			
C8	Cap, 250uuf ±5% 500 WVDC silver mica	DM15E251J	I	1
C9	Cap, 0. 1uf, same as C1			
L1	Coil, RF 1. 0mh	U102	AC	7
Q1	Semiconductor Device, Transistor NPN	RC3710	U	19
Q2	Semiconductor Device, Transistor, same as Q1			
R1	Res. 10K ½W ±5% carbon	RC20GF103J	A	16
R2	Res. 10K, same as R1			
R3	Res. 680Ω ½W ±5% carbon	RC20GF681J	A	5
R4	Res. 33K ½W ±5% carbon	RC20GF333J	A	3
R5	Res. 2700Ω ½W ±5% carbon	RC20GF272J	A	4
R6	Res. 68Ω ½W ±5% carbon	RC20GF680J	A	3
R7	Res. 3300Ω ½W ±5% carbon	RC20GF332J	A	4
R8	Res. 2200Ω ½W ±5% carbon	RC20GF222J	A	6
R9	Res. 150Ω ½W ±5% carbon	RC20GF151J	A	1
R10	Res. 33K, same as R4			
R11	Res. 10K, same as R1			
R12	Res. Variable 500Ω 1/8W ±20%	220S501B	C	1
Y1	Crystal 250. 0000 KHZ	TYPE CR-46A/U	K	1

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A3			
C1	Cap. 0.1uf -20 +80% 25 WVDC Disc ceramic	5815Y5U104Z	L	*
C2	Cap. 0.1uf ±10% 200 WVDC metalized mylar	210B1C104K	H	*
C3	Cap. 0.1uf, same as C2			
C4	Cap. 0.01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	*
C5	Cap. 0.1uf, same as C2			
C6	Cap. 1500uuf ±5% 500 WVDC silver mica	DM19E152J	I	1
C7	Cap. 4000uuf ±5% 500 WVDC silver mica	DM19E402J	I	1
C8 △	Cap. 47uuf ±5% 500 WVDCN330 disc ceramic	0801000S2H0470J	L	1
C9	Cap. 27uuf ±5% 500 WVDC NPO disc ceramic	0851000C0G0270J	L	1
C10	Cap. variable 1.5-10uuf air dielectric 3121 Ser. No. 126-371, 3126 Ser. No. 511-575	189-4-5	F	1
C10	Cap. variable 1.7-20uuf air dielectric 3121 Ser. No. 372 up, 3126 Ser. No. 576 up	193-6-5	F	2
C11	Cap. 110uuf ±5% 500 WVDC NPO disc ceramic	0841000C0G0111J	L	1
C12	Cap. 1.7-20uuf, same as C10			
C13	Cap. 155uuf ±5% 500 WVDC N80 disc ceramic	0845030U1G01550J	L	1
C14	Cap. variable 2.2-34uuf air dielectric	193-10-5	F	2
C15	Cap. 535uuf ±1% 500 WVDC silver mica	DM19E535OF	I	1
C16	Cap. 2.2-34uuf, same as C14			
C17	Cap. 33uuf ±5% 500 WVDC NPO disc ceramic	0851000C0G0330J	L	1
C18	Cap. 0.01uf, same as C4 3121 Ser. No. 432 up 3126 Ser. No. 666 up			
CR1	Semiconductor Device, Diode**	RY3605	U	1
L1	Coil, RF 1.0mh	U102	AC	*
L2	Coil, RF 150uh	3150-12	AC	*
L3	Coil, RF Var. .5-1.5uh 3121 Ser. No. 126-371 3126 Ser. No. 511-575	3121L3	U	1
L3	Coil, RF Var. 1.5-3.1uh 3121 Ser. No. 372 up 3126 Ser. No. 576 up	3121L3A	U	1
L4	Coil, RF 150uh, same as L2 (not used on 3126 Ser. Nos. 511-515)			
Q1	Semiconductor Device, Transistor, NPN	RC3710	U	*
Q2	Semiconductor Device, Transistor, same as Q1			
R1	Res. 68Ω ½W ±5% carbon	RC20GF680J	A	*
R2	Res. 68Ω, same as R1			
R3	Res. 680Ω ½W ±5% carbon	RC20GF681J	A	*
R4	Res. 1000Ω ½W ±5% carbon	RC20GF102J	A	13

△Temperature Coefficient Selected as required

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A3 (continued)			
R5	Res. 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R6	Res. 10K ½W ±5% carbon	RC20GF103J	A	*
R7	Res. 10K, same as R6			
R8	Res. 2700Ω ½W ±5% carbon	RC20GF272J	A	*
R9	Res. 1000Ω, same as R4			
R10	Res. 1000Ω, same as R4			
R11	Res. 47Ω ½W ±5% carbon 3121 Ser. No. 432 up 3126 Ser. No. 666 up	RC20GF470J	A	1
S3	Switch, Rotary	3121S3	U	1
T1	Transformer, Balanced Demodulator**	58-122-02	AD	11

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A4			
C1	Cap. 0.01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	*
C2	Cap. 0.1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
C3	Cap. 0.1uf ±10% 200 WVDC metalized mylar	210B1C104K	H	*
C4	Cap. 0.1uf, same as C2			
C5	Cap. 0.1uf, same as C2			
C6	Cap. 0.01uf, same as C1			
C7	Cap. Var. 5-25uuf 350 WVDC NPO ceramic	055705139A	L	4
C8	Cap. Var. 5-25uuf, same as C7			
C9	Cap. Var. 5-25uuf, same as C7			
C10	Cap. Var. 5-25uuf, same as C7			
C11	Cap. 68uuf ±5% 500 WVDC silver mica	DM15E680J	I	1
C12	Cap. 0.01uf, same as C1			
C13	Cap. 0.1uf, same as C3			
C14	Cap. 0.1uf, same as C2			
C15	Cap. 0.1uf, same as C2			
C16	Cap. 0.01uf, same as C1			
C17	Cap. 0.1uf, same as C3			
C18	Cap. 0.1uf, same as C2			
C19	Cap. 0.1uf, same as C2			
C20	Cap. 0.1uf, same as C2			
C21	Cap. 0.01uf, same as C1			
C22	Cap. 0.1uf, same as C3			
C23	Cap. 0.1uf, same as C2			
C24	Cap. 0.1uf, same as C2			
C25	Cap. 0.01uf, same as C1			
C26*	Cap. 0.1uf, same as C2			
CR1	Semiconductor Device, Diode	1N277	Y	3
FL1	Filter, Bandpass 2215 KHZ 100 HZ When Used	3121FL1-100	U	1
FL1	Filter, Bandpass 2215 KHZ 250 HZ BW	3121FL1	U	1
FL2	Filter, Bandpass 2215 KHZ 2500 HZ BW	3121FL2	U	1
L1	Coil, RF 1.0 MH	U102	AC	*
L2	Coil, RF 1.0 MH, same as L1			
L3	Coil, RF 1.0 MH, same as L1			
Q1	Semiconductor Device, Transistor, NPN	RC3710	U	*
Q2	Semiconductor Device, Transistor, Same as Q1			
Q3	Semiconductor Device, Transistor, Same as Q1			
Q4	Semiconductor Device, Transistor, Same as Q1			
Q5	Semiconductor Device, Transistor, Same as Q1			

*Not used on Ser. No. 722 up

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A4 (continued)			
Q6	Semiconductor Device, Transistor, Same as Q1			
Q7	Semiconductor Device, Transistor, Same as Q1			
Q8	Semiconductor Device, Transistor, Same as Q1			
R1	Res. 200Ω ½W ±5% carbon	RC20GF201J	A	1
R2	Res. 6200Ω ½W ±5% carbon	RC20GF622J	A	1
R3	Res. 4300Ω ½W ±5% carbon	RC20GF432J	A	1
R4	Res. 10K ½W ±5% carbon	RC20GF103J	A	*
R5	Res. 68Ω ½W ±5% carbon (See Note 1)	RC20GF680J	A	1
R6	Res. 680Ω ½W ±5% carbon	RC20GF681J	A	*
R7	Res. 10K, same as R4			
R8	Res. 2700Ω ½W ±5% carbon	RC20GF272J	A	*
R9	Res. 3900Ω ½W ±5% carbon	RC20GF392J	A	3
R10	Res. 390Ω ½W ±5% carbon	RC20GF391J	A	3
R11	Res. 680Ω, same as R6			
R12	Res. 1100Ω ½W ±5% carbon**	RC20GF112J	A	1
R13	Res. 47K ½W ±5% carbon	RC20GF473J	A	1
R14	Res. 18K ½W ±5% carbon	RC20GF183J	A	2
R15	Res. 10K, same as R4			
R16	Res. 3900Ω, same as R9			
R17	Res. 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R18	Not used			
R19	Res. 10K, same as R4			
R20	Res. 4700Ω ½W ±5% carbon	RC20GF472J	A	6
R21	Res. 1000Ω, same as R17			
R22	Res. 10K, same as R4			
R23	Res. 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R24	Res. 390Ω, same as R10			
R25	Res. 10K, same as R4			
R26	Res. 27K ½W ±5% carbon	RC20GF273J	A	1
R27	Res. 1000Ω, same as R17			
R28	Res. 10K, same as R4			
R29	Res. 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R30	Res. 2700Ω, same as R8			
R31	Res. 390Ω, same as R10			
R32	Res. 680Ω, same as R6			
R33	Res. ½W ±5% carbon, When Used	RC20GF	A	1
S4	Switch, Rotary	3121S4	U	1
	Note 1: Value selected to give proper CAL LEVEL range.			

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A4 (continued)			
T1	Transformer, IF 2.215 MC	B3807	AK	3
T2	Transformer, IF, same as T1			
T3	Transformer, IF, same as T1			

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A5			
C1	Cap. 10uf -10 +100% 15 WVDC dry electrolytic	30D106G015BA2	AF	*
C2	Cap. 100uf -10 +100% 30 WVDC dry electrolytic	11-65PSS100-30S	AE	2
C3	Cap. 0.1uf ±10% 200 WVDC metalized mylar	210B1C104K	H	*
C4	Cap. 200uuf ±5% 500 WVDC silver mica	DM15E201J	I	1
C5	Cap. 0.1uf -20 +80% 25 WVDC disc ceramic	5815YU104Z	L	*
C6	Cap. 59uuf ±5% 500 WVDC silver mica	DM15E590J	I	1
C7	Cap. 0.01uf ±20% 200 WVDC disc ceramic	0805030Z5U00103M	L	*
C8	Cap. 0.01uf, same as C7			
C9	Cap. 0.01uf, same as C7			
C10	Cap. 0.01uf, same as C7			
C11	Cap. 10uf, same as C1			
C12	Cap. 10uf, same as C1			
C13	Cap. 0.01uf, same as C7			
C14	Cap. 10uf, same as C1			
C15	Cap. 10uf, same as C1			
C16	Cap. 10uf, same as C1			
C17	Cap. 0.1uf, same as C3			
CR1	Semiconductor Device, Diode	SM210	V	1
CR2	Semiconductor Device, Diode	1N277	Y	*
CR3	Semiconductor Device, Diode, same as CR2			
L1	Coil, RF 1.0 MH	U102	AC	*
L2	Coil, RF 1.0 MH on earlier units. See R24			
Q1	Semiconductor Device, Transistor NPN	2N3053	A1	1
Q2	Semiconductor Device, Transistor NPN	RC3710	U	*
Q3	Semiconductor Device, Transistor, same as Q2			
Q4	Semiconductor Device, Transistor, same as Q2			
Q5	Semiconductor Device, Transistor, same as Q2			
Q6	Semiconductor Device, Transistor, same as Q2			
R1	Res. 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R2	Res. 820Ω ½W ±5% carbon	RC20GF821J	A	1
R3	Res. 68Ω 2W ±5% carbon	RC42GF680J	A	1
R4	Res. 60.4K 1/4W ±1% Metal Film	RY60D60R4F	U	1
R5	Res. 10K ½W ±5% carbon	RC20GF103J	A	*
R6	Res. 2000Ω ½W ±5% carbon	RC20GF202J	A	1
R7	Res. 4700Ω ½W ±5% carbon	RC20GF472J	A	*
R8	Res. 1000Ω, same as R1			
R9	Res. 8200Ω ½W ±5% carbon	RC20GF822J	A	2

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A5 (continued)			
R10	Res. 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R11	Res. 1000Ω, same as R1			
R12	Res. 1000Ω, same as R1			
R13	Res. 4700Ω, same as R7			
R14	Res. 4700Ω, same as R7			
R15	Res. 33K ½W ±5% carbon	RC20GF333J	A	*
R16	Res. 2200Ω, same as R10			
R17	Res. 8200Ω, same as R9			
R18	Res. 4700Ω, same as R7			
R19	Res. 1000Ω, same as R1			
R20	Res. 10K, same as R5			
R21	Res. 2200Ω, same as R10			
R22	Res. 3300Ω ½W ±5% carbon	RC20GF332J	A	*
R23	Res. 1000Ω, same as R1			
R24	Res. 3900Ω ½W ±5% carbon Note: R24 replaces L2 on later units. Use R24 for replacement on all units.	RC20GF392J	A	*
S5	Switch, Rotary	3121S5	U	1
VR1	Semiconductor Device, Diode	1N960B	D	1
Y1	Crystal 2213.5 KHZ	159	K	1
Y2	Crystal 2216.5 KHZ	160	K	1

PARTS LIST

Sym	Description	Part No.	Mfr	Tot Qty
	Module A6			
C1	Cap. 25uf -10 +100% 20 WVDC dry electrolytic	BSK8-25-20P	S	1
C2	Cap. 10uf -10 ±100% 15 WVDC dry electrolytic	30D106G015BA2	AF	*
C3	Cap. 100uf -10 +100% 30 WVDC dry electrolytic	11-65PSS100-30S	AE	*
C4	Cap. 0. 1uf -20 +80% 25 WVDC disc ceramic	5815Y5U104Z	L	*
C5	Cap. 0. 1uf, same as C4			
CR1	Semiconductor Device, Diode	1N914	D	3
CR2	Semiconductor Device, Diode, same as CR1			
CR3	Semiconductor Device, Diode, same as CR1			
Q1	Semiconductor Device, Transistor	RC3710	U	*
Q2	Semiconductor Device, Transistor, same as Q1			
Q3	Semiconductor Device, Transistor	2N3638	M	1
Q4	Semiconductor Device, Transistor	2N3706	Z	2
Q5*	Semiconductor Device, Transistor, same as Q4			
R1	Res. 4700Ω ½W ±5% carbon	RC20GF472J	A	*
R2	Res. 10K ½W ±5% carbon	RC20GF103J	A	*
R3	Res. 10K, same as R2			
R4	Res. 2200Ω ½W ±5% carbon	RC20GF222J	A	*
R5	Res. 1000Ω ½W ±5% carbon	RC20GF102J	A	*
R6	Res. 560Ω ½W ±5% carbon	RC20GF561J	A	1
R7	Res. 470Ω ½W ±5% carbon	RC20GF471J	A	2
R8*	Res. 470Ω, same as R7			
R9	Res. 18K ½W ±5% carbon	RC20GF183J	A	*

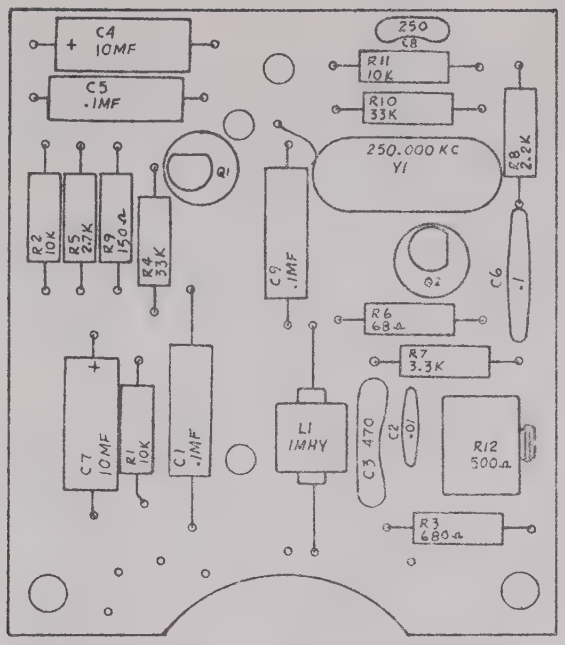
* Not used on Ser. No. 693 and 713 up

Rev 1

PARTS LIST

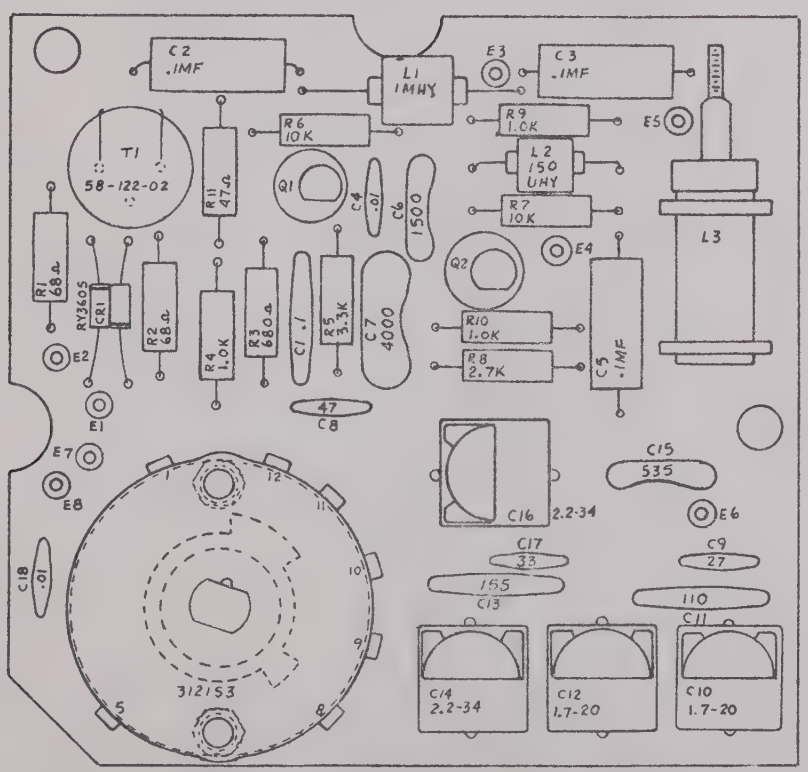
Sym	Description	Part No.	Mfr	Tot Qty
	Miscellaneous			
BT1	Battery 12V 1.2 ah nickel cadmium Ser. 511-706	41B001KD07*	N	1
	Battery 12V 1.2 ah nickel cadmium Ser. 707 up	41B001KD20*	N	1
C1	Cap. Var. Air 11-150uuf	167-153-10	F	1
FL3	Filter, Lowpass	3121FL3	U	1
J1	Connector, electrical power	H1061	AA	1
J2	Jack, Headset	L-12A	X	1
L1	Coil, RF, 17uh 3121 Ser. No. 126-371 3126 Ser. No. 511-575	3121L1	U	1
L1	Coil, RF, 15.6uh 3121 Ser. No. 372 up 3126 Ser. No. 576 up	3121L1A	U	1
L2	Suppressor, Parasitic 3121 Ser. No. 248 up 3126 Ser. No. 544 up	3121L2	U	1
L3	Not used			
L4	Suppressor, Parasitic 3121 Ser. No. 432 up 3126 Ser. No. 666 up	3121L4	U	1
LS1	Loudspeaker	S8837	T	1
M1	Multimeter, Replacement	3005-41	U	1
R1	Res. Var. 25K ½W ±30% with S7	PF3890	C	1
R2	Res. Var. 10K ½W ±30%	NW8746	C	1
R3	Res. 47Ω ±5% ½W carbon 3121 only	RC20GF470J	A	1
S6	Switch SPDT Push-button momentary	903	X	1
S7	Switch SPST Push-pull part of R1			*
T1	Transformer, Power	3121T1	U	1
WA	Cable Assembly, Power	17258S	B	1

* Use 41B001KD20 as a replacement for 41B001KD07 or MP404T



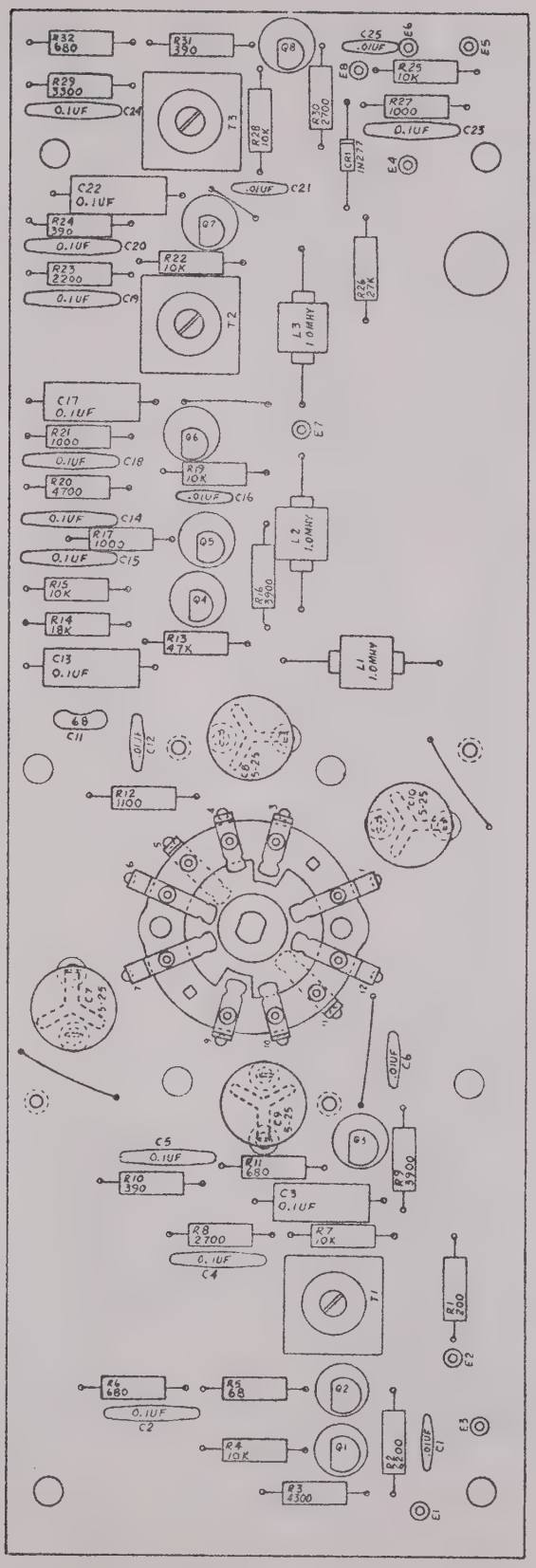
TERM	WIRE COLOR
1	GR
4	GR-W
5	R-WH
6, 7	COAX
8	R

Figure 7. Module A2



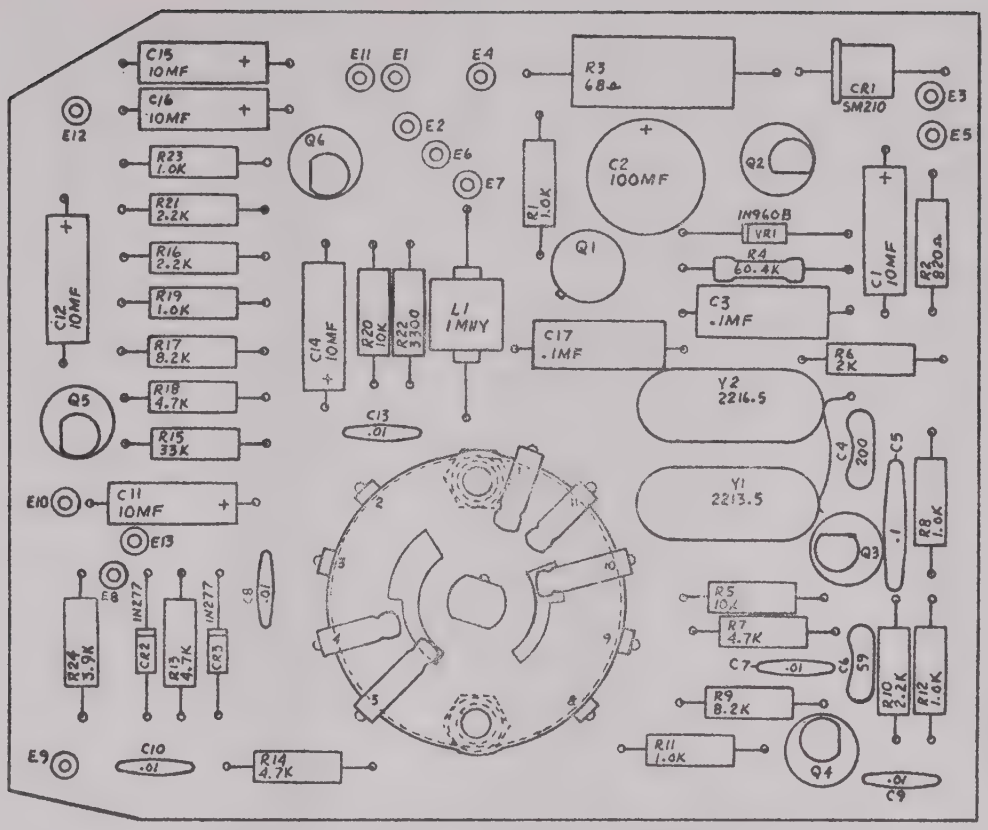
TERM	WIRE COLOR
E1, E2	COAX
E3	L4
E4	BUS
E5	BUS
E6	BUS

Figure 8. Module A3



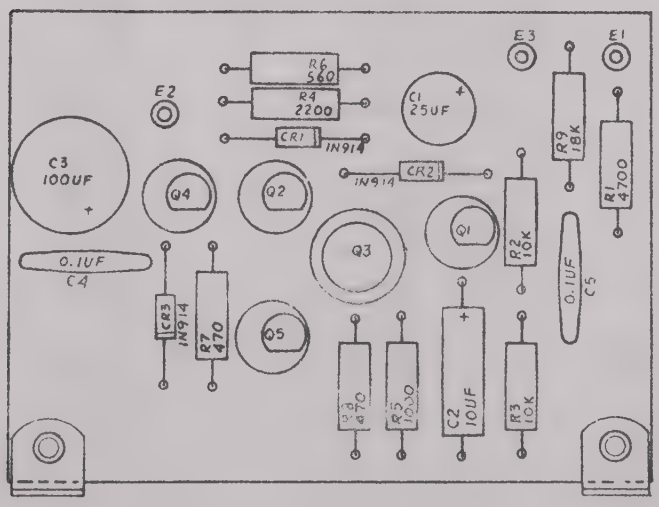
TERM	WIRE COLOR
E1	R
E2	COAX
E3	BUS
E4	Y-WH
E5	V-WH
E7	R
E6, E8	COAX

Figure 9. Module A4



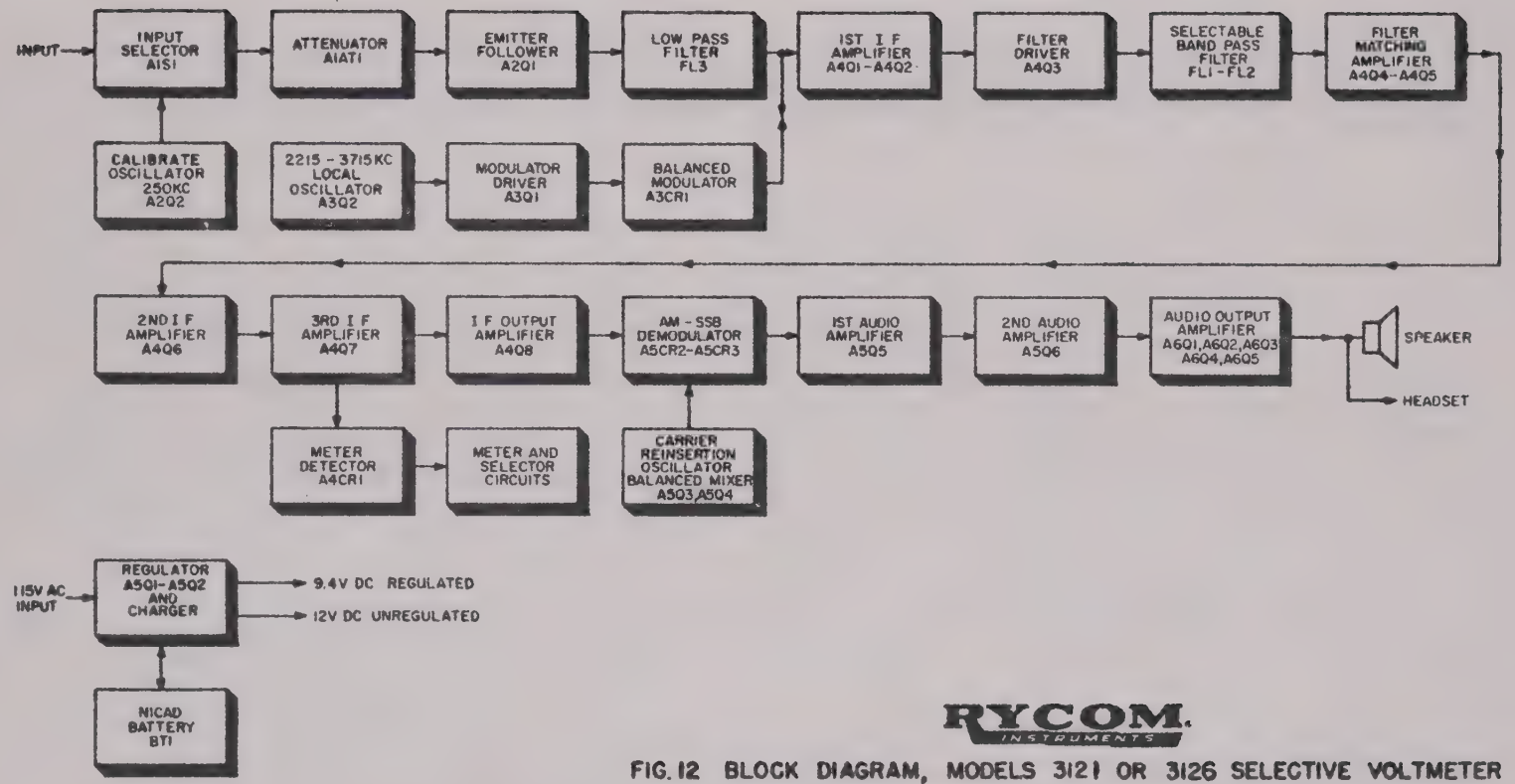
TERM	WIRE COLOR
E1	R-BK
E2	R
E3	GR
E4	R-WH
E5	OR
E6	R
E7	R
E9	GR
E10	GR-WH
E11	R-BK
E12	BL-WH
E8, E13	COAX

Figure 10. Module A5



TERM	WIRE COLOR
E1	BL-WH
E2	R-BK
E3	BL

Figure 11. Module A6



RYCOM INSTRUMENTS

FIG. 12 BLOCK DIAGRAM, MODELS 3121 OR 3126 SELECTIVE VOLTMETER

ISSUE 1, 2 + 8 - 66
SER NO. 511 - 515

ISSUE 2, 4-18-66 REV 753-1
MOVED RED WIRE FROM A2-PIN 8 TO A4-L2,L3 JCT.
A4R12 WAS 1,300. A3C9 WAS 33 ADDED A3L4.
SER. NO. 516 - 530

ISSUE 3, 6-30-66 REV. 754-17
A1C1 WAS 1.00UF AIR9 WAS 1,580.
A4R10-390, A4R11-680 REVERSED. ALL 2N3706'S
WERE TI4I4, ALL 2N3710'S WERE TI417.
ADDED A3C17
SER NO 531-543

ISSUE 4, 2-13-67 REV. 754-21
ADDED L2
SER NO 544-552

ISSUE 5, 2-13-67 REV. 754-21
R7 WAS 4,990
SER NO 553-575

ISSUE 6, 2-13-67 REV. 756-13
A3C10 WAS 1.5-10. A3L3 WAS .5-1.5UHY
SER NO 576-653, 655-665

ISSUE 7, 2-22-68 REV. 758-36
ADDED L4. ADDED A3C18, A3L7,
A3L8, A3R11. A5Q1 WAS 2N3706 A5R24
WAS 1.2 1.0MHY A2RIO WAS A2R10.
A2C9 WAS A7CH-A3CH7, IN3605
SER NO 432, 654, 666-681

ISSUE 8, 5-1-68 REV. 758-40
ADDED A1C5, A1R4 WAS 1,780, A1R5 WAS
6,040, A1R6-1,780 DELETED. A2C1 WAS
0.47UF. A4R5 WAS 68.
A2D4 SER NO. 682-692 &
694-712

ISSUE 9, 8-6-68 REV. 758-42
DELETED A6C5, A6R8.
SER NO 693, 713-764

ISSUE 10, 4-17-69 REV 765-38
A3R4 A3R11 REVERSED. A3C2, A3C3 &
A3R6 GIVE ERROR CORRECTED. A3C8
WAS N330, A3C13 WAS 180 NPO, A1C17
WAS 10. A6C2# DELETED.
SER NO. 765

ATTENUATOR AT1 PART OF MODULE A1 ABOVE

NOTES

1. UNLESS OTHERWISE NOTED RESISTANCE VALUES ARE IN OHMS, K=1,000.
2. UNLESS OTHERWISE NOTED CAPACITANCE VALUES ARE IN (UUF) MICRO-MICROFARADS.
3. REFERENCE DESIGNATIONS ARE ASSIGNED STARTING WITH (1) ONE AT EACH MODULE, TO DEFINE PART AND LOCATION PREFIX THE REFERENCE DESIGNATION WITH MODULE IDENTIFICATION, SUCH AS, A2R1. CHASSIS COMPONENTS ARE NOT PREFIXED IN THIS MANNER.
4. ALL ROTARY SWITCHES ARE VIEWED FROM KNOB END AND ARE SHOWN IN THEIR EXTREME COUNTER CLOCKWISE POSITION. REFER TO INDIVIDUALS FOR THE SCREENING AT EACH POSITION.
5. PANEL AND CHASSIS SCREENING DENOTED BY [ ] BOXES.
6. SWITCH S7 [PULL ON] PART OF R1 [AUDIO LEVEL] CONTROL.
7. ALL TRANSISTORS ARE TYPE NC3710 EXCEPT WHEN NOTED.

7 SWITCH A1S1 [INPUT SELECTOR] SCREENING

	WE		CAL
IN	EW		135Ω
	GR		BRG
	OR		600Ω
OUT	WE		TERM
	EW		135Ω 600Ω

8 SWITCH A1S2 [ATTENUATOR] SCREENING.

-40	OI	1-20
-50	003	3-10
-60	001	1-0
-70	0003	3+10
-80	000	10+20

9 SWITCH A3S3 [BAND SELECTOR] SCREENING

A	B	C
1	2	3

10 SWITCH A4S4 [SELECTIVITY] SCREENING

2.5KHZ	250HZ
1	2

11 SWITCH A5S5 [MONITOR] SCREENING

AM	LSB	USB
1	2	3

RYCOM INSTRUMENTS

FIG. 13 SCHEMATIC DIAGRAM, MODEL 3126 SELECTIVE VOLTMETER

58417